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30 July 2015

Version of attached file:

Accepted Version

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Negro, G. and Hannan, M. T. and Fassiotto, M. (2015) 'Category signaling and reputation.', *Organization science.*, 26 (2). pp. 584-600.

Further information on publisher's website:

<http://dx.doi.org/10.1287/orsc.2014.0935>

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CATEGORY SIGNALING AND REPUTATION

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ABSTRACT. We propose that category membership can operate as a collective market signal for quality when low-quality producers face higher costs of gaining membership. The strength of membership as a collective signal increases with the sharpness of the category boundary, or contrast. Our empirical study focuses on biodynamic and organic viticulture in Alsace.

1. INTRODUCTION

The curious success of biodynamic winemaking in Alsace provides an opportunity to gain some new and general insight about how categories structure markets. Many renowned wineries in the region follow the very unconventional biodynamic approach, proposed by the Austrian polymath Rudolph Steiner in a series of lectures in 1924. His holistic approach to farming builds on principles involving cosmic forces that outsiders find bizarre. His claim that “gnomes, undines, sylphs and fire spirits are actively involved in plant growth” (Steiner, 2003, 158) gives the flavor of this approach. Given its eccentricity and the lack of an obvious link with making high-quality wines, we wondered why membership in the biodynamic category has gained a favorable reception from critics and consumers, and whether (and how) audiences have come to interpret biodynamics as a signal of quality.

Attempting to answer these questions led us to consider that processes of market signaling might operate at the category level. According to theories of market signaling, some agents can signal their otherwise hard-to-observe

Date: January 22, 2013.

We thank Amir Goldberg, Greta Hsu, Wes Longhofer, Susan Olzak, Chris Rider, Peter Roberts, Anand Swaminathan, Peter Thompson, seminar participants at Durham University, Emory University, London Business School, Northwestern University, Stanford University, the University of Toronto, and the Nagymaros Workshop for helpful comments. We are grateful to our informants for their time. We also thank Severine Piot, Diane Valahu, and Abdul Zaheer for research assistance and Hayagreeva Rao for his contribution to earlier stages of the project that led to this paper. This research was supported by Emory University and the Stanford Graduate School of Business. We remain responsible for errors and omissions.

quality and the audience can use the signal as a screening mechanism. For an action to be a signal, the cost of producing the signal must decrease with increases in the agent’s quality. Then a separating equilibrium can result where those who provide the signal have higher average quality (Spence, 1974). We argue that membership in sharply bounded categories can work parallel to individual market signals.

Noise can affect the interpretability of signals. For example labels of provenance can be faked or confused with others; producers can claim to use practices that they do not. Such noise will diminish the efficiency of signals tied to individual producers. We propose that *category* signals can identify otherwise-unobservable differences in quality in such settings. This requires that (1) low-quality producers find it more costly to gain category membership and (2) the category has sharp boundaries, high contrast in technical terms.

Signaling theories do not explicitly address why certain actions or claims come to be interpreted as signals. All that matters is that the signal, however chosen, separates high- and low-quality producers in equilibrium. A focus on categories provides some analytic leverage on this issue. It seems likely that a history of high average level of quality of the producers whose performances are observed increases the likelihood that membership in the category gets taken as a signal of superior capability by the audience. In other words, category membership emerges as a signal similarly to how groups develop reputations (Tirole, 1996). Indeed we shift the emphasis from the producer to the audience. Instead of focusing on the producer’s choice to send a signal, we emphasize the audience’s “discovery” of a signal.

To preview our analysis of Alsatian winemaking, we focus on two unconventional and categorically coded approaches to viticulture—organic and biodynamic. We argue that conformity to the codes for these categories requires higher capability and commitment (and higher costs of production) than conventional winemaking. Membership in either category therefore qualifies as a market signal of quality.

However, the biodynamic category arguably has sharper boundaries (higher contrast) than organic winemaking for two reasons. First, its bizarre practices (e.g., using cow horns and red-deer bladders to cure manure and yarrow blossoms in sprays for vineyards and compost) and the additional commitment these practices represent make biodynamicists stand out. Second, the organic category has a fuzzy boundary due to the perceived overlap with

another proto-category, “sustainable,” whose adherents claim to be “nearly organic.” This confusion lowers the contrast of the organic—but not the biodynamic—category. This leads us to think that membership in biodynamics sends a stronger market signal because of its high categorical contrast.

Our first analysis shows that higher-quality Alsatian wineries have higher hazards of becoming biodynamic but not organic. This suggests a reputational basis for the emergence of a category signal for the biodynamic category but not the organic one. Then, we document two market outcomes: critics’ ratings and retail prices. Ratings by international critics tasting blind (who do not know the identity of the producer or its categorical affiliations) are significantly more positive for wineries after they join either the biodynamic or organic category than before. A parallel analysis finds that ratings by prominent French critics who do know the producer’s identity favor biodynamic over conventional wines but not so for organic wines. Wineries also benefit from certifying their affiliation to the biodynamic category. A final analysis of the American retail market similarly indicates price advantages for wineries using unconventional practices. Prices also increase with higher critics’ ratings and certification. Interestingly, these effects do not seem enough to also increase profitability.

2. THEORY

Market Signals. Offerings and producers in markets generally differ in quality. Information about quality tends to be asymmetric: a job applicant, a loan seeker, and a used-car seller tend to know more than the prospective employer, lender, and buyer. In general, both high-quality producers and audience members benefit from transmission of reliable information about quality. The benefits consist of material advantages, e.g., higher prices. Intrinsic motivations also matter. For example, producers might take personal pride in the recognition of their offering as high quality.

Those possessing high quality face the problem of their actions being mimicked or faked. How can they convince the audience of their capability? This is where market signals come in. The signaling mechanism can address information asymmetry by yielding equilibria in which only high-quality producers find it worthwhile to invest in the signal. This requires that producing

the signal is less costly for highly capable producers.¹ In Spence’s job-market model, prospective employees can demonstrate their (potential) productivity by investing in education, which those of low potential find more costly (requiring more effort). Applications of market signaling consider investments made by individual agents: in economics, Spence (1973a,b, 1974); in biology, Zahavi (1975) and Grafen (1990); in political science, Jervis (1970), and in sociology Gambetta (2009).²

Many markets for consumer goods, including food and clothing, pose challenges to interpreting market signals. For instance, labels that denote geographical provenance or special inputs can be imitated. Such fakery calls into question the authenticity of any producer in the market, which weakens the connection between quality and observable characteristics. Individual signals will lose their diagnostic power and the resulting equilibrium will be a so-called pooling equilibrium (with mixes of high- and low-quality producers lumped together) rather than a separating one.³

In some cases, category signals—collective signals associated with category membership—can still solve the problem of information asymmetry in the face of noise. The advantage of category signals comes partly from the fact that multiple producers can display the signal. Political scientists make this argument about the efficiency of investing in industry associations for political action by individual firms; see, for example, Lohmann (1993). Moreover, because multiple producers use the same sign, collective signaling enhances interpretability. The audience likely trusts conformity to a category more than idiosyncratic individual observables. For example, collective enforcement has more credibility than individual monitoring over one’s own actions.⁴ Sociological and anthropological accounts have long maintained

¹A signal does not need to but can be productive in the sense that adopting the signal improves performance. For a productive signal to operate effectively, the increase in productivity must be less than the cost of acquiring the signal (Spence, 1974).

²Our argument relates more directly to Spence’s model than to others, particularly Podolny’s 1993 status-signal model. Spence begins with quality differentials and derives signals; Podolny begins with the status signal and derives differences in quality.

³This is the reason why many labels are legally protected in the global market. Take, for example, the use of the label “Champagne.” While originally a term reserved for a style of wine, in order to avoid questions of fakery, the label is now legally protected in most markets to include only producers from the Champagne region of France.

⁴Take a more specific example, the signal of compliance to fair-labor standards in the apparel industry. Nike and Reebok invested in factory standards in Indonesia that were superior to the local legal requirements. They hired auditors of the working conditions in their plants, but the audits were not seen as credible. The companies gained credibility

that costly signs of group membership are correlated with intra-group cooperation and limited free-riding behavior.

Category Contrast. Properties of categories likely shape the possibility that a categorical signal emerges and persists. In our interpretation, the matter lies in the hands of the audience and any number of properties might matter in any particular situation. Some possibilities are likely accidental and not subject to prediction. We narrow our focus to one that has proven to have predictive value: the sharpness of the category boundary.

The line of theory we follow ties the sharpness of the boundary of a category to contrast. High contrast means that category membership is nearly crisp: producers tend to be fully in or out. For example, brewpubs have higher contrast than microbrewers in the beer industry due to storefront location and visibility of the production equipment to the public. One can hardly mistake them for some other kind of brewery or business (Carroll and Swaminathan, 2000). More abstractly, contrast is defined as the average grade of membership in the category of the producers to which the audience applies a category label.

High contrast increases the likelihood that audience members use similar interpretive schemas for a category (Hannan, Pólos, and Carroll, 2007). When such agreement obtains, audience members will generally find that the producers to which others have assigned the label will also have observable features that fit their understandings of the category. Under such conditions, conformity to category schemas by those bearing the category label becomes accepted as natural, or taken for granted.

We suggest that categories with high taken-for-grantedness can support strong category signals. Category members will have highly similar observable characteristics and audience members will apply the label in very similar ways. When one member applies the label to a producer, then others will also likely treat it as satisfying the category code (Hsu, Hannan, and Pólos, 2011). The core of our argument is that, if membership in a category serves as a market signal of quality, then the strength of this signal increases with the category's contrast.

Category Reputation. Models of signaling explain how signals can operate to separate agents of different quality. But the knowledge of what

by joining a coalition of other manufacturers, activists, and labor groups, which organized the audits.

sending and receiving a message means plays a critical role also (Gambetta, 2009). These are matters more of interpretation than intention. Agents need not know that their actions transmit a signal for the signaling argument to hold. How do certain messages become interpreted as collective signals of quality?

Models of collective reputation propose one answer (Tirole, 1996; Levin, 2009). These models too assume imperfect observability of current and past individual behavior and quality, which introduces noise in the screening process of products or workers by buyers or employers. In such situations, individual reputations have limited value. However, individual agents can also belong to collective entities, to social groups.

The current quality of a group is partially observable over the market interface. In the models of Tirole (1996) and Levin (2009) the quality of a group is simply the average quality of its members. The group's past quality, which Tirole defined as the "track record" of past generations of members, is its collective reputation. Individual members affiliate with a group based on the advantages linked to its collective reputation. A bad reputation creates incentives for members to cut corners, because high quality would not be rewarded. Conversely, a good reputation produces incentives for striving for quality. When membership and past track record of the group are known, collective reputation conveys information about the average current quality of individual members.

The assessment of individual quality in the presence of collective reputations builds on the group's history. The reputation developed by group members influences individual behavior and predicts future behavior reliably. Of course, groups can include opportunists. But since individual advantages depend on collective reputation, groups with good reputations sustain discipline and opportunists tend to behave honestly or be excluded.

In the context of market categories, these models suggest that categories with high contrast successfully sustain reputations for high quality. Audience members can more easily come to agreement about meaning in the high-contrast case, as we discussed above. Such agreement facilitates monitoring and sanctioning of fakery. Monitoring becomes easier because high contrast means fewer producers have partial memberships of middling value; there is less gray area. Sanctioning is easier because what one audience member finds troubling will also trouble others when the audience agrees about meaning.

As we describe below, membership in a high-contrast category visibly indicates a group of producers known for attaching great importance to the

value of input factors and for being attentive to the conditions in which products are made. Such past investments shape expectations of quality (Kreps and Spence, 1985). In this fashion, track records can affect the emergence of membership in a high-contrast category as a signal of quality.

Category memberships thus operate as *common signatures* in the producer-audience interface (Bacharach and Gambetta, 2001). Categories with generally accepted representations among audience members (schemas) can serve to fill in missing quality information in a market like wine, with its pronounced information asymmetry (Nelson, 1970). Membership in a category can therefore provide relatively sticky information about quality that substitutes for continuous updates of beliefs based on observation of market interactions.

The general principle of market signaling must apply for category membership to serve as a market signal: it must be more costly for producers of inferior quality to gain recognition as a category member. Additionally, the strength of a category signal presumably depends on the sharp boundary of the category: its contrast.

3. BIODYNAMIC AND ORGANIC WINEMAKING IN ALSACE

We now explore the potential analytic value of the notion of category signaling by delving into the case of Alsatian winemaking. Biodynamic and organic practices have spread rapidly in the region of Alsace, in the north-east of France. In 1980, only one winery in the region was biodynamic, and one was organic. By 2010 more than half of the 142 wineries in our data had joined one of these categories (30 biodynamic and 44 organic). Many wineries deemed by experts to be among the best have joined the organic and biodynamic categories. Of the producers rated in 2008 as “exceptional” by influential expert Robert Parker, six are biodynamic and two are organic; of the ten rated as “excellent,” five are biodynamic and three are organic. We find this development interesting because adhering to biodynamics and organics increases production costs considerably. It was not clear that the market would pay a premium for these wines or indeed if they would have more than a fringe market.

The biodynamic and organic categories are viewed as organized sets of practices and have rules of conduct; in other words, they have codes. What are these codes? While organic agriculture has become fairly mainstream,

TABLE 1. Codes of biodynamic and organic farming.

<i>Biodynamic & Organic</i>
Excludes chemical fertilizers
Excludes growth regulators
Excludes GMOs
Avoid risk of pesticide drifts from neighboring farms
Long-term plan for maintaining soil fertility
Monitoring suitable cleaning measures
<i>Biodynamic only</i>
Philosophical motivation
Observation of lunar and other cosmic rhythms for crop cultivation
Create biodiversity in the field
Moderate or no use of SO ₂
Manual harvesting
Manual selection
Preparations:
500 Cow manure buried in cow horns in the soil over winter
501 Ground quartz buried in cow horns in the soil over summer
502 Yarrow flowers buried sheathed in a stag's bladder
503 German chamomile flowers sheathed in a cow intestine
504 Stinging nettles buried in the soil in summer
505 Oak bark buried sheathed in the skull of a farm animal
506 Dandelion flowers buried sheathed in a cow mesentery
507 Valerian flower juice sprayed over or inserted in the compost
508 Common horsetail made either as a fresh tea or fermented liquid manure applied to the vines or to the soil

biodynamic production remains more esoteric. The biodynamic code subsumes the organic and goes further. It proposes a unified approach to agriculture that relates the ecology of the earth to that of the entire cosmos. Biodynamics sets itself apart from other agricultural systems, including organic farming, by its association with the precepts of anthroposophy proposed by Rudolph Steiner in the 1920s. His teachings propose that the farm is a living organism. Biodynamic farming prescribes the use of certain practices including use of a set of preparations to promote healthy soil and plant growth (Steiner, 2003), described in Table 1.

The colorful and mystical practices of biodynamics mark a very strong turn from the scientific winemaking of the New World. Especially conspicuous is the use of several fermented “preparations” as field sprays and compost inoculants. These preparations consist of plant parts or extracts treated with

animal tissues that have been buried in the soil. For instance, the iconic Preparation 500 is made by filling cow horns with manure from lactating cows fed with biodynamic grains, burying them in the vineyard on the autumn equinox, and digging them up on the spring equinox. Farmers then make very diluted liquids by combining about one teaspoon of the cured manure with about 40–60 liters of water and stirring for one hour in a pattern that “dynamizes” it. The preparation is then sprayed on the vines in the descending phase of the moon. (Reliance on astral and lunar calendars for timing actions in the vineyard and the cellar is a hallmark of this approach.) Adherents believe that these preparations stimulate soil cycling, promote healthy plant growth and optimal compost development, and have myriad other beneficial effects.

A study comparing organic and biodynamic vineyard treatments found that both improve soil quality over conventional cultivation, but soil parameters or tissue nutrients do not differ significantly between biodynamic and organic (Reeve, Carpenter-Boggs, Reganold, McGourty, and McCloskey, 2005). If viticultural science tells us that these methods produce similar improvements, we reasoned that the romantic, non-rational imagery of biodynamics and its apparatus of precepts could serve as the basis for a very distinctive identity in the market, which might be valued either positively or negatively.

Winemaking Practices and Quality. Issues of wine quality arise at least at two levels. First, there is what might be called *abstracted quality*. Here the issues are mainly technical, including: is the taste clean and intense; are the acids balanced; how much minerality is detected; are flavor and aroma complex; are there off smells, tastes, or reduction? Then, the next level concerns *contextualized quality*. Here the issues are more socially embedded and involve typicality and authenticity. They include whether the wine faithfully expresses the region’s identity and tradition, the winery’s *terroir*⁵, and the winemaker’s style.

Quality depends on hundreds, perhaps thousands, of decisions that are not observable to outsiders. These include: how much care was taken in pruning and canopy management; how much was yield controlled; whether the harvest was timed appropriately; whether the grapes were properly sorted; how

⁵*Terroir* is a somewhat mystical French notion that refers to the unique combination of geographical, pedological, and climatic characteristics of a certain land.

cold soaking was conducted; how fermentation, racking, and filtering progressed; whether anything (acids, sugar, oak chips or fluids, coloring agents, and so forth) was added to the product; whether the wine was ultra-filtered or put through reverse-osmosis.

The producers know these facts; the audience does not. How a wine from a past vintage tastes can prove a useful guide for the audience to assess current quality. But, producers change practices all the time in response to changes in climatic conditions or technical developments. Wine quality can only be assessed accurately in the act of consumption. This explains why critics have such importance as well as why information communicated through market signals has value for foretelling quality of wines and other experience goods.

Producers' Views. We conducted semi-structured interviews with *vignerons* from 23 wineries in 19 villages in Alsace in 2009 and 2010 from which the quotes in this section are drawn. The interviews allowed us to better understand the process of joining the biodynamic and/or organic categories. Because we knew less about them, we targeted more (14) biodynamic wineries. These interviews were extremely valuable in providing some insight into the core issues from the producers' perspective. They also help us understand the applicability of our theoretical argument to the empirical case.

Costs of Category Membership. Organic and biodynamic practices impose higher costs than those they replaced. Adopting either method rules out the use of some labor-saving practices (e.g., the use of herbicides as a substitute for plowing). And, biodynamic production also imposes distinctive practices, such as spraying with the famous preparations and elaborate procedures of composting.⁶

In our fieldwork informants provided some information on this issue (unless noted otherwise all quotes come from the field interviews described above). One, from Wintzenheim, said: “[W]e earn less money than a conventional winery because we have 20% lower yields. We have 30% more handwork. In France, it costs a lot of money. So, for me to produce a bottle of wine, it costs at least 50% more. But we cannot charge 50% more.” (11/20/2009) And a biodynamic winemaker from Turckheim told us:

⁶Cole’s fieldwork among Oregon wineries suggests that managing biodynamic vineyards costs 15% more than managing a sustainably farmed property and hiring a consultant can cost a thousand dollars per visit. Certification is a few hundred dollars, and applicants also pay a licensing fee of 0.5% on gross sales. Cole notes: “For the same price, organic certification sounds like a safer bet.” (Cole, 2011, 58)

“It’s not the organic and biodynamic estates that make the higher profits, because we have higher costs but the price of the bottle is not that much more expensive. An organic or biodynamic wine doesn’t cost 40% or 50% more than a conventional wine at the same quality level, from the same area and in the same style. We are maybe less profitable ... I employ about seven more people per hectare than the average in the area ... for a bottle of wine my labor cost is several times higher.” (11/17/2009)

The central issue for signaling is whether the cost of the signal is negatively associated with quality. We think that there are good reasons for thinking that this is the case here. Both organic and biodynamic category codes bring viticulture closer to the traditional craft of farming but impose discipline. Eschewing chemical pesticides requires great attention to the vineyard and skill in reacting to the appearance of pests. Wine-writer Kramer (2010, 117) argues the case for biodynamics in particular, which requires elaborate manual procedures and organizing by multiple natural cycles:

“Biodynamic cultivation signals a willingness to pay extreme attention to vines and wines. Like driving a race car, if you take your eyes off the road—or in this case a highly vulnerable vineyard—an irremediable disaster can result. Ask any farmer: attentiveness is always a good thing ... biodynamic processes are a form of discipline, some of which may actually work, while other practices may be more emotionally and psychologically sustaining to the practitioner than practical to the plant or wine.”

Adopting Biodynamic and Organic Practices. We learned that the initial turn to biodynamic and organic production stemmed from a mix of intertwined reasons including making higher-quality wines that also better reflect the *terroir* and protecting the environment. Arguably, the experience of these dedicated producers provided a plausible connection between unconventional practices and quality.

Many winemakers observed that chemical herbicides and pesticides had killed organic life in the soil and had diminished wine quality. For instance, a winemaker in Turckheim focusing on the abstracted dimension said:

“Chemical products and technology were a real miracle. They helped the growers a lot in reducing the amount of heavy-duty, physical work. It made it a lot easier, allowed the growers to do more vineyard stuff, so to be more productive, to lower the cost of a bottle of wine. Growers like my father were told ‘this is new, it’s modern, it works, it doesn’t pollute, it’s clean,’ all the stuff you want to hear. It took years to realize that—Oh it was supposed to help me, but, in fact, I’m getting more and more diseases and more problems, and my soil has lost its fertility.” (11/17/2009)

Many also suspected that the degradation of the vineyards had lowered the quality of the wine. For instance, a vintner in Beblenheim recalled:

“I was thinking we were wrong—we should turn to a better agriculture. We were destroying what is the foundation of everything. I saw some vineyards, tasted some wines, and I thought what could help me get more harmonious wines, more complex wines? The wines we were producing before sold nicely, they had good reviews from Parker. But I found that I liked less and less what I was producing.” (12/8/2010)

Others told us that they started to notice off-aromas in the wine, increasing heaviness, less minerality, and the loss of the ability of the wines to age properly.

The theme of contextualized quality as a motivation for moving away from conventional practices also comes through strongly in our interviews, especially with biodynamic wineries. A vintner from Wintzenheim said: “...my objective is not to be biodynamic ... [but] to make the best wine from the place, from our soils, from our *terroir*. And the icing on the cake is that it’s biodynamic ... because [this is] the more natural way to reach this goal.” (11/20/2009) Another from Ammerschwihr agreed: “We have a great *terroir*... For us biodynamics ... really allows the *terroir* to express itself much better in the wine.” (11/18/2009) And one from Epfig said:

“*Terroir* is the key for great wines. There is no great wine without *terroir* ... that [biodynamics improves the expression of *terroir*] is why you move to biodynamics because you are convinced, because you have an environmental consciousness,

but also you can come to biodynamics without any environmental consciousness because biodynamics increases *terroir* in taste.” (11/19/2009)

Contrasts of Biodynamic and Organic Categories. Many consider the practices of biodynamic viticulture bizarre, which makes them highly salient. A winemaker from Wintzenheim, who joined biodynamics in 1996, said that many scoffed at these methods: “Early on, everyone was laughing at us. They were only waiting for us to have problems, to lose a harvest. But I knew what I was doing. I was sure. But these were hard times.” (11/17/2009) Another said: “A neighbor... told me in Alsatian dialect, ‘at your place, you really have grass for the rabbit.’ I mean, for him it was dirty because you had plants, herbs, and flowers in the vineyard.” (11/20/2009)

A leader in the biodynamic movement told us his reaction to a lecture by François Bouchet (who influenced many who converted to biodynamics): “I thought that’s a fantastic thing. It’s crazy, it sounds absolutely mad, but it was also quite fascinating and interesting.” (11/17/2009) It is precisely the unusual quality of its practices that makes this category stand out, that gives it high contrast. Adhering to a category that demands use of bizarre practices and incurs ridicule, in addition to greater amounts of time investment, plausibly signals a commitment to quality.

Relatedly, the requirement of these practices means that organic production can represent one step along the way to becoming biodynamic. As a result, the movement of higher quality producers to biodynamic from organic will further lower the contrast of the organic category as biodynamic production, with its added practices and requirements, becomes regarded as the end goal. Second, the contrast of “organic” is lowered by its perceived overlap with *lutte raisonnée* (loosely, the reasoned struggle), which might be called sustainable farming. This competing code specifies “minimal” use of herbicides and pesticides. In Alsatian winemaking, this alternative is promulgated by an association called Tyflo, which encourages: “... production of economically-viable high-quality grapes, giving priority to ecologically sound methods... in order to preserve the environment and human health” (Tyflo, 2011).

Theories of market signaling suggest that low-quality producers have an incentive to imitate a market signal (Spence, 2002). *Lutte raisonnée* appears to us to imitate the signals of higher quality in the market. However, this imitation muddies the contrast of the organic signal. The organic producers

face a problem: the practitioners of *lutte raisonnée* claim to be nearly organic. Their presence on the scene, as well as the attempts by their industry association to legitimate their “nearly organic” character, blurs the boundaries of the organic category but, due to its sharper boundaries, not the biodynamic one. Indeed “organic” and “sustainable” are often used interchangeably blurring distinctions between these labels (Ministère de l’Agriculture, 2011; European Commission, 2012).

The claim to be nearly organic incites strong reactions towards *lutte raisonnée*. For instance, the director of a large organic producer in Riquewihr said: “I’ve never met somebody who’s not at least *raisonnée*. Because if you are not, you are really a dirty bastard!” (11/19/2009) A biodynamicist from Epfig also objected: “*Lutte raisonnée*—it’s a big lie. It’s an invention from the classic agriculture to give a smoke screen about the real practice and to produce some confusion with real organic practice.” (11/19/2009) Another from Pfaffenheim, said: “We should call it *pollution raisonnée*. The solution was to say we do *lutte raisonnée*—they are organic but we are *raisonnée*, it’s almost like organic farming. That’s not true! It has nothing to do with organic farming.” (12/9/2010)

The arguments detailed above about category contrast lead us to expect that membership in the biodynamic category sends a stronger signal of quality than membership in the organic category in the Alsatian context. We conduct empirical analyses to see whether this is the case once appropriate controls for confounding influences are made. To be clear, we observed the main patterns in the average ratings by category before building models. The pattern suggested to us that a signaling interpretation might be warranted. This means that we cannot perform an independent test of the implications of the argument. At best, our empirical work speaks to the plausibility of the theoretical story.

4. RESEARCH DESIGN

In addition to the qualitative data from in-person interviews described in the previous section, our quantitative data come from three archival sources and a phone survey.

The first archival source is Robert Parker’s *Wine Buyer’s Guide*. Parker is widely regarded as the world’s most influential wine expert (Hadj Ali, Lecocq, and Visser, 2008). The guide compiles scores for wineries on a five-star scale, where five stars indicate the highest rating, producers that

“make the greatest wine of their viticultural region, and they are remarkably consistent and reliable even in mediocre and poor vintages” (Parker 1993, 8). We constructed a time series of ratings from the seven editions of the guide.⁷ Because of its focus on wineries of high quality, we use this source to understand generalized winery quality. Our main ratings analyses focus on the next two archival sources.

The second archival source is the U.S. publication *Wine Spectator*, arguably the most influential wine guide internationally. Its online database contains tasting notes for Alsatian wines from the issues of February 1987 through August 2010. WS practices blind tasting: its tasters and editors do not know who made the wine or how much it costs when they assign a score, but they do know some of the context including the vintage, appellation, and grape variety. Each editor generally covers the same wine regions from year to year, allowing lead tasters to develop expertise in a region. Other tasters might participate in blind tastings to help confirm impressions. However, the lead taster always has the final say.

The third source is *Le Guide de Vins de France*, curated by Gault et Millau, a sister publication to the well-known review of restaurants in France. Starting in 1984, GM published special bulletins with general notes on leading wineries and price information for a few selected wines, but no comprehensive ratings. These earlier editions provide us with winery-level information, particularly price levels and the number of bottles produced. From the 2003 edition, the guide provides comprehensive wine ratings. We coded label-level information in this and subsequent yearly editions through 2010. The GM guide has considerable influence in France. Wineries often highlight the ratings received from the guide in the “pressrooms” on their websites.

Beginning with the 2007 edition, GM tells about the viticultural practices of interest. However, we lacked such data for earlier periods. Accordingly, we conducted a telephone survey in 2010 with informants from all the wineries with wine ratings in either guides, a total of 155 wineries. We asked

⁷We record the number of stars assigned to wineries for the vintages covered by the guides as follows: First edition (1988): 1981, 1982, 1983; Second edition (1990): 1984, 1985, 1986; Third edition (1993): 1988, 1989, 1990; Fourth edition (1995): 1991, 1992, 1993; Fifth edition (1999): 1994, 1995, 1996; Sixth edition (2002): 1998, 1999, 2000; Seventh edition (2008): 2003, 2004, 2005. Values for four intervening years (1987, 1997, 2001, and 2002) were linearly interpolated from the years immediately preceding and following. At the time of writing, Parker had not yet published an eighth edition; accordingly, we carried forward the ratings from the 2008 edition. The number of wineries rated grows unevenly over time from 38 in 1988 to 60 in 2008, reaching a maximum of 66 in the 1999 edition.

about viticultural practice, particularly biodynamics and organics, as well as certification in these categories. We obtained such data for 142 of the 155 wineries. Our informants also indicated when they began bottling, which we use to determine the time at risk of conversion. We used these data to code memberships in the two non-conventional categories. We code the distinction between organic and biodynamic production as mutually exclusive: “organic” means “organic-but-not-biodynamic” throughout. Because of the inherent ambiguity in adherence to sustainable, or *lutte raisonnée*, practices (with several producers claiming adherence and no strict method to ascertain these claims), we do not try to distinguish membership in the “sustainable” camp. These producers are part of the “conventional” category in all analyses.

When we analyze the hazards of becoming biodynamic or organic as a function of a winery’s quality, we use three indicators of quality. The first measures the quality of resource endowments by the number of *grand cru*, the highest quality classification for a vineyard, in the wineries portfolio. The other measures are experts’ assessments of the overall quality of a winery’s products. One is Parker’s overall ratings of wineries, described above. But, Parker reviews wines openly, and these ratings likely reflect some combination of quality and status. As an alternative, we use the average of WS’s blind ratings of a winery’s products by vintage.

When we seek to understand how critics and consumer audiences respond to category signals, we follow previous studies and characterize such response in terms of ratings assigned by specialized critics and of prices in retail markets (Shrum, 1991; Hsu, Hannan, and Koçak, 2009; Kovács and Hannan, 2010).

We first examine ratings based on WS’s blind tastings, where category signals remain hidden. Members of the unconventional categories can receive better evaluations in these tastings only to the extent that they put more discipline into their work, i.e., the investment in the signal is productive. One category will receive higher ratings than another only if its practices improve on the other’s.

We also examine ratings from GM’s non-blind tastings. Here, the taster knows the identity of the producer but not the wine’s price. When the evaluator knows producers’ identities, the category schemas enter directly in evaluations. One such schema is what wine journalist Kramer (2010, 39) calls site deference: “less about where great wines come from and more how they

are from.” Knowledge of the context of production can shape perceptions of a wine as different. This is where biodynamics stands out more sharply due to the high contrast owing to the philosophical framework, the odd practices, and the potential confusion of the boundary of organic production created by the claims of the “sustainable” producers. Our argument implies that biodynamic wines will receive better ratings than organic wines when the evaluator knows the producer’s identity. Arguably, the blind tastings incorporate the abstracted quality dimension we described above. The non-blind tastings can also feature the contextualized dimension more explicitly.

The GM guide presumes that its audience cares about the categories we are studying. It categorizes wineries as conventional, organic, or biodynamic. Given our emphasis on the distinctiveness of biodynamics, we find it interesting that it chose to symbolize organic wine with a generic leaf and biodynamic wine with a more distinctive crescent moon.

We treat the difference in tasting method as providing a unique opportunity to distinguish more clearly the effects of category memberships. Inference depends on the counter-factual assumption that blind tastings by GM would provide the same patterns of association as recorded from the blind WS ratings. Clearly we cannot verify that this is the case; and our conclusions are therefore conditional on this assumption. We face the extremely common (but seldom acknowledged) situation in which only replication can validate our analytic strategy.

We also examine retail prices in the American market using WS data. Categorical signals can affect prices in two ways, directly via audiences’ interpretations of the categories and indirectly via critical evaluations. Consumers have less domain knowledge than specialized critics. In the wine world, over 100,000 different labels compete in the marketplace. Because clear and simple information has great value for consumers, signaling ought to operate powerfully.

5. RESULTS

Quality and Category Membership. How does quality affect the choice to adopt biodynamic or organic practices? We address this question by estimating the effect of a variety of measures of winery quality on the hazard of joining the two categories during the period ranging from 1981, the first year of available winery scores from Parker, through 2010.⁸

⁸Only one winery started using biodynamic methods before the start of the study period (in 1969) and one started using organic methods before the start of the study period (in

We use lagged values of the three measures of each winery’s quality discussed in the previous section: number of *grand crus*, Parker’s ratings, and WS ratings.⁹ We control for the size of the operation, measured as the number of bottles produced (in thousands) using data from the GM and WS and the telephone survey, and calendar year (set to zero in 1981), which controls for time effects including trends in the wine market. We include a left-censoring dummy equal to one for wineries in operation in 1981. The model analyzing the hazard of joining the biodynamic category includes a control for whether the winery had already become organic (six had done so); no winery moved the other way.

The strong and consistent finding is that the hazard of adopting biodynamics increases with winery quality (Table 2, columns 1–3). The effect of quality on the biodynamic hazard is positive and statistically significant for all three measures. In contrast, the effects of winery quality on the hazard of joining the organic category are negative but not statistically significant (Table 2, columns 4–6). So on average the biodynamic wineries had high quality when they joined, but this was not the case for the organic category.

This initial difference in average levels of pre-membership quality suggests a reputational basis for the biodynamic category signal. The difference in prior quality made membership in the biodynamic category more likely to become a category signal than membership in the organic category, issues of contrast aside. This makes it imperative that we control for track records of quality in analyzing the effects of category membership on ratings and prices.

Effects on Critical Evaluations: Levels. Next we analyze the ratings assigned to wines by GM and WS for the vintages from 1981 through 2008 (the most recent vintage covered by the publications at the time of writing). The analysis includes ratings of all dry white wines and excludes sparkling wines and red wines because they differ substantially in production processes

1970). We excluded both from the analysis of changes in categorical membership. Our informants suggested to us that these early conversions were somewhat unusual. The very first biodynamicist in the region was said to have converted because he had been poisoned by pesticides. One vintner in Pfaffenheim recalled “he was blind for a week. He couldn’t see anything and so he said to himself, ‘I will no longer work with such products’.” (12/09/2010)

⁹In additional analyses, we included shared frailties in the same model specifications to correct for unobserved winery characteristics. The patterns we found are similar to those reported, while the frailty parameters did not reach statistical significance. For ease of interpretation we present estimates without such corrections.

TABLE 2. Winery quality and the hazards of becoming biodynamic and organic (ML estimates of constant hazard models)

Variable	Effect on the hazard of becoming:					
	Biodynamic			Organic		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-7.27* (0.870)	-8.20* (0.790)	-23.6* (7.61)	-8.58* (0.773)	-8.53* (0.773)	-3.76 (5.52)
Number of <i>grand crus</i>	0.612* (0.124)			-0.105 (0.231)		
Parker winery rating		0.318* (0.105)			-0.065 (0.104)	
Mean WS rating			0.205* (0.078)			-0.074 (0.062)
Bottles produced	-0.002* (0.001)	-0.002* (0.001)	-0.002* (0.001)	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0004 (0.0004)
Left censoring	0.422 (0.392)	0.705 (0.396)	0.025 (0.615)	-0.481 (0.342)	-0.487 (0.344)	0.028 (0.592)
Year trend	0.063* (0.023)	0.086* (0.020)	0.079 (0.052)	0.133* (0.021)	0.133* (0.021)	0.175* (0.061)
Already organic	2.74* (0.389)	2.53* (0.400)	2.13* (0.618)			
Log pseudolikelihood	-37.1	-41.6	-4.00	-59.8	-59.8	-7.9
Number of observations	3790	3790	592	3813	3813	632
Number of producers	142	142	82	142	142	83

Notes: * $p < .05$; standard errors adjusted for clustering on winery in parentheses.

and only a small fraction of the high-quality producers make them. The dataset generated from the two publications comprises 4,715 ratings from GM and 3,775 ratings from WS. The dependent variable is the critical rating of a wine on a 100-point scale.¹⁰

The controls include dichotomous variables that identify wines made from old vines, *vieilles vignes* (VV), and *vendange tardive* (VT) or *selection grains nobles* (SGN) wines, two types of late-harvest wine. We include the lagged star rating in Robert Parker’s guide to measure a winery’s vintage-to-vintage variation in quality and status. Alternatively, we include lagged scores in WS and GM ratings to control for variation at the level of the specific wine. All specifications also include a linear time trend and fixed effects for vintages, as well as for the grape varieties from which Alsatian white wines can be made, and for each of the 51 *grand crus*, the sites judged by the French authorities as producing exceptional wines. Finally, we include the predicted hazards of becoming biodynamic and organic obtained from the hazard analysis to address endogeneity concerns for the time-varying propensity to commit to unconventional methods. Thus we control for various forms of heterogeneity among wines and wineries.

Category Signals. We take advantage of the difference in the method of evaluation used by the two sources to address two questions. First, are the categories productive? That is, do category members receive different evaluations on average from those who practice conventional winemaking when the evaluator does not know either the identity of the producer or its categorical membership? Second, do the results of non-blind tastings and blind tasting diverge as our argument suggests, that the returns in ratings are substantially higher for biodynamics than for organics in non-blind tastings as compared with blind tastings?

We explore the productivity question by analyzing the (blind) WS ratings. In both analyses we control for persistent differences stemming from endowments and winemakers’ skills in analyzing ratings by examining only *within-winery* variation over vintages. That is, we use fixed-effects at the winery level. This lets us examine the effects of changes in practices; we

¹⁰WS used a 100-point scale throughout. GM used a 100-point scale until 2007, then switched to a 20-point scale. For comparability we converted the latter to the 100-point scale. The median score is 87 for both GM and WS, and the fraction in the upper range is similar: the top ten percent of wines receive a score of 90 or higher in GM and 91 or higher in WS. The publications differ somewhat in the lower range distribution: the value of the first decile in the GM ratings is 73 and 80 in WS.

compare a producer’s ratings after joining biodynamics or organics to its ratings before.

We see in the estimates of column 1 in Table 3 that WS ratings rise significantly after a winery becomes *either* biodynamic or organic. As one would expect, formal certification in either category does not matter in the blind evaluations (column 2 in Table 3). We cannot reject the null hypothesis that the effects of the two category memberships are equal ($X^2 = 0.13$, $p = 0.72$ with 1 df). Adopting the practices consistent with either category is productive—improves quality, but apparently not differently so.

Overall, this pattern conforms to the notion that membership in both categories can potentially serve as a categorical signal of quality. Moreover, these estimates suggest that critics and consumers do *not* have a “real” basis for preferring biodynamic over organic wine, at least according to the aesthetics of the WS tasters.

We turn now to our second research question: does category membership convey a signal of quality? We explore this question by comparing effects of the category memberships on the (open) GM ratings and the blind WS ratings. That is, we compare the effects of categorical memberships in columns 1 and 3 (and 2 and 4) in Table 3. We see that the effect of biodynamic production is again positive and significant; indeed the magnitude of this effect is nearly double that estimated from the WS blind tastings.¹¹ Moreover, the effect of organic production is much smaller. Indeed, the organic effect is negative for the GM ratings. We see in column 4 that certified membership in biodynamics seems to amplify the positive effect for this category for the GM ratings. This pattern agrees with our expectations based on considerations of category signaling and contrast.

Our argument does not predict that the organic effect would be significantly negative in non-blind tastings. Although the effect is not stable in all analyses in the Discussion section we speculate about what this might mean.

Dynamics. It is natural to wonder whether the effect of converting to either set of practices remains stable over time. We address this issue by estimating dynamic models for ratings. We do so by including lagged ratings as covariates, which converts the specifications we have used to this point to growth models—see Tuma and Hannan (1984, Part III)). (The lagged rating

¹¹In additional analyses not reported for brevity, we found no evidence that membership in the biodynamic category has a stronger effect for lower quality members, as would be the case if there were a simple status spillover mechanism at work.

TABLE 3. Effects of category membership on ratings from blind tastings by Wine Spectator and non-blind tasting by Gault et Millau (OLS estimates of winery-fixed-effect regressions)

Variable	<i>Wine Spectator</i>		<i>Gault et Millau</i>	
	Model 1	Model 2	Model 3	Model 4
Constant	87.0*	87.0*	91.1*	90.9*
	(2.35)	(2.35)	(6.05)	(6.04)
Biodynamic producer	0.706*	0.732*	1.30*	1.30*
	(0.232)	(0.249)	(0.444)	(0.444)
Organic producer	0.860*	1.148*	-2.18*	-2.06*
	(0.410)	(0.449)	(0.420)	(0.423)
Biodynamic certification		-0.123		1.83*
		(0.308)		(0.594)
Organic certification		-1.38		-0.654
		(0.826)		(0.762)
Parker winery rating	-0.018	-0.019	-0.171	-0.170
	(0.080)	(0.080)	(0.103)	(0.103)
Old vines (VV)	0.243	0.239	0.131	0.135
	(0.353)	(0.353)	(0.324)	(0.323)
Late harvest (VT or SGN)	2.40*	2.39*	0.667*	0.658*
	(0.211)	(0.211)	(0.226)	(0.225)
Year trend	0.011	0.18	-0.538*	0.541*
	(0.089)	(0.089)	(0.223)	(0.233)
R ² within	0.279	0.280	0.437	0.439
Number of observations	3775	3775	4715	4715

Notes: * $p < .05$; standard errors (adjusted for clustering on winery) are in parentheses. The specifications include predicted hazards of becoming biodynamic and organic, and fixed-effects for varietal, *grand cru*, and vintage.

is not available for a wine's first entry into the data, and so the number of cases and of wineries drop.)

Here we face another choice on what variation to analyze. If we continue with fixed-effects for wineries, we will learn how ratings change after conversion as compared with before. But the audience is not static. So it seems more interesting to compare patterns of changes in ratings between those who change memberships with those who do not. This means analyzing both within- and between-winery variation. We do so using the method of

TABLE 4. Effects of category membership on changes in critical ratings (GEE estimates)

Variable	<i>Wine Spectator</i> Model 1	<i>Gault et Millau</i> Model 2
Constant	86.2* (10.7)	85.9* (39.3)
Biodynamic producer	0.848* (0.210)	1.79* (0.530)
Organic producer	0.297 (0.443)	-1.13 (0.586)
Biodynamic certification	0.028 (0.265)	1.85* (0.827)
Organic certification	-1.39 (0.744)	0.297 (1.20)
Wine WS rating	0.136* (0.014)	
Wine GM rating		0.269* (0.020)
Old vines (VV)	0.370 (0.393)	0.126 (0.449)
Late harvest (VT or SGN)	2.57* (0.202)	0.203 (0.355)
Year trend	0.427 (0.405)	-1.22 (1.51)
Wald X ²	1592	2182
Number of observations	2413	2557
Number of producers	71	113

Notes: * $p < .05$; robust standard errors are in parentheses. The specifications include the same fixed effects and covariates as in Table 3.

generalized estimating equations which report average differences adjusted for values of covariates (including lagged dependent variables).¹²

Biodynamic membership has a significant positive effect on the change in WS ratings, but organic membership does not (Table 4, column 1) This suggests the presence of general and continuing gains in quality from biodynamics linked to vineyard and cellar management.

For GM ratings (column 2 in Table 4), the effect of biodynamic membership on change is again positive and significant; but the effect of organic

¹²This method provides high-quality estimates of average effects that do not depend on the distribution of the unobservables (Zeger, Liang, and Albert, 1988).

membership on change is negative and not significant. Moreover, formal certification as biodynamic amplifies the effect of category membership.

These estimates imply that quality ratings of biodynamic and organic wines continue to diverge and that the difference will become greater with the continued use of the two sets of practices. Moreover, some of this pattern appears to arise from category signals, because the positive effect of use of biodynamics on change in ratings is much larger in open tastings (GM) than in blind ones (WS). In other words, the strength of the category signal increases over time. This seems plausible in the context because the confusion effect of the sustainable category has likely intensified as the size of its membership has grown.¹³

So the categorical signals differ substantially, as predicted. The critics usually know the categorical memberships, so the signals work even when the winery does not seek and receive formal certification. There is some evidence that getting such certification amplifies the signal for critics.

Effects on Retail Prices. How does category membership affect the general audience and the market? We gain some insight on this question by analyzing retail prices when the wines first appeared on the American market. Unlike the critics, the consumer audience likely does not know about actual practices but can easily learn about certification from widely posted lists of membership, from wine labels, and from guides such as GM, Hachette, and others. So we expect that certification will matter to American consumers. Including this analysis on retail prices allows us to understand the effect of biodynamic and organic practices in the supply and demand dynamics of the consumer market.

WS collects price information from retailers and producers. We adjusted nominal prices for inflation dividing them by the consumer price index (1982 = 1). The distribution is skewed to the right so we use the natural log transformation as the dependent variable. The modeling strategy follows closely that used to analyze critical ratings. One difference is that we add a control for critical scores obtained from the WS to account for the impact of quality of the focal wine on prices. Due to missing prices for some wines, the final dataset covers 3,545 wines from 96 wineries.

¹³Tyflo began in 1997 with 20 members; the membership had grown to 71 in 2012 (Tyflo, 2011).

TABLE 5. Effects of category membership on (log) retail prices (GEE estimates)

Variable	Model 1	Model 2
Constant	0.922 (0.678)	0.600 (0.694)
Biodynamic producer	0.082* (0.013)	0.067* (0.014)
Organic producer	0.074* (0.024)	0.127* (0.026)
Biodynamic certification		0.051* (0.018)
Organic certification		−0.216* (0.045)
WS rating of focal wine	0.025* (0.001)	0.025* (0.001)
Parker winery rating	0.041* (0.005)	0.040* (0.05)
Old vines (VV)	0.136* (0.020)	0.137* (0.021)
Late harvest (VT or SGN)	0.673* (0.012)	0.671* (0.012)
Year trend	−0.030 (0.026)	−0.017 (0.026)
Wald X ²	15904	15480
Number of observations	3545	3545
Number of producers	96	96

Notes: * $p < .05$; robust standard errors are in parentheses. The specifications include the same fixed effects and covariates as in Table 3.

Biodynamic and organic wines garner higher prices than conventional wines, net of the effect of WS ratings (column 1 in Table 5). The effects of the two memberships are nearly equal.

Formal certification also affects prices significantly, positively for biodynamic and negatively for organic wines in the American market (see also Delmas and Grant (2011)). Given that the clearest signal of membership in these categories comes from formal certification, this pair of results also supports our interpretation of the situation. The stronger signal comes from membership in the category with higher contrast. The price regressions control for Parker’s winery ratings and the WS rating of each wine. The

estimates indicate that the status accorded to a winery by Parker significantly increases prices in the U.S. market, as does quality measured in blind ratings. Again, the category effects hold net of these factors.

The estimated effect of biodynamic membership (Table 5, column 1) implies that the expected retail prices of biodynamic wines rise 8% after conversion. Taking account of the indirect effect on prices through the effect on ratings, the combined effect implies an increase of roughly 11%. The anecdotal evidence we collected suggests that conformity to the biodynamic codes increases a winery's operational costs by at least 20%. The increase in prices barely goes to repay the associated higher costs of producing the categorical signal. Consistent with what our informants said, biodynamic practice likely reduces profits at least in the short run.¹⁴ We suggested that winemakers might value long-term gains in productivity, sustainability, and/or emotional benefits, which are not reflected in current prices.

6. DISCUSSION AND CONCLUSION

We began with an empirical puzzle: many highly regarded Alsatian winemakers broke ranks with the highly technicized modern approach to winemaking and adopted the seemingly irrational practices of biodynamics without appearing to be met with a negative reaction in the market. Our effort to explain the pattern led us to think of category memberships operating as market signals. This conceptualization requires attention both to costs of membership and to category boundaries. Theories of market signals emphasize that signals provide information about quality (in equilibrium) when the costs of producing the signal fall with the producer's quality. When the signal comes from membership in a social category, the strength of the signal increases with the contrast of the category.

We think that the conditions for category signaling hold in Alsatian winemaking. Biodynamic and organic methods are costly, but more costly (and risky) for less capable wineries. However, the biodynamic category has higher contrast than the organic one due both to its many strange practices and lack of overlap with the "nearly organic" *lutte raisonnée*. So biodynamics,

¹⁴In markets like these where competing producers sell differentiated products, (1) changes in prices that are proportionate to changes in costs and (2) stationary demand curves, i.e., firms are moving along the same downward sloping demand curve and not switching curves, result in decreasing profits (Dixit and Stiglitz, 1977). Because the elasticity of demand exceeds one, revenues as well as profits are lower.

because of its crisper boundary, sends a stronger positive signal of quality than organic production.

We find that high-quality wineries join the biodynamic category at higher rates, but not the organic one. We also find that wines made by biodynamic wineries receive higher ratings from critics in blind and non-blind tastings. Formal biodynamic certification increases ratings, but only when the taster knows the identity of the producer. Organic wines also receive higher scores, as high as those of biodynamic wines, when producers' identities are hidden. But organic wines do not receive higher scores when the evaluator knows the producer's identity. In some regressions organic wines even receive significantly lower scores than conventional wines. Formal certification as organic amplifies this negative effect. Finally, wines made by either biodynamic and organic wineries command higher retail prices in the U.S. retail market, where category membership has visibility.

Because critics and consumers see high-quality producers move to biodynamic production in the first place, the subsequent higher quality of biodynamic producers can operate as a "self-confirming belief": incoming data in a feedback loop confirm the quality signal (Spence, 1973a). However, the difference in reactions to organic wines in blind and open tastings seems striking, especially given that GM professes a commitment to supporting "natural wines." This difference in blind and non-blind reviews for these two costly categories is interesting precisely because it suggests that the signaling power of the high-contrast biodynamic category matters more to reviewers than that of its organic counterpart.

What can we make of the negative effect of organic membership from the non-blind tastings? The enormous divergence in the effects of organic viticulture on estimates of quality in blind and non-blind tastings points to a category-reputation effect. But this would not have an obvious basis from our research. Recall that we found that the hazard of adopting biodynamics was significantly higher for higher-quality/status wineries. But we did not find that the hazard of adopting simple organic production was significantly lower for the higher quality wineries. The effects of winery quality/status are negative but very small and insignificant. If the pattern of findings about membership and critical ratings reflects only a reputation effect, then we would expect to find that the wineries that went organic were substantially lower in initial quality, which we do not.

Moreover, organic winemaking does not appear to have a negative valuation in wine markets (see, for example, Asimov (2012)). In fact, it tends to be regarded with favor in the wine world. Results from a consumer survey indicated that the majority of American respondents who had tasted organic wines had a positive opinion of their quality (Delmas and Grant, 2011). The French government and the European Commission also explicitly favor the use of organic practices and define them as “good for nature and good for consumer” (European Commission, 2010). The Gault et Millau publication, from which we culled our data, champions wines that are close to natural as possible, and put organic in this group of “real” wines (in 2010 the editors published a guide focused on organic wineries). Finally, our analysis controlled for fixed winery characteristics, including the durable aspects of winery status. The effects we report are therefore largely cleansed of these effects.

Nonetheless, some anecdotal evidence suggests that organic wines might have initially gained a poor standing in the French market. Several organic and biodynamic winemakers told us that they did not indicate their category membership on labels because they did not want their wines to be sold in wineshops that specialized in organic wines, because they judged that some of the wines on offer in those shops were of low quality. The winemakers worried about spillover effects of reputation. So perhaps we do see the consequences of an initial low reputation for organic wines (at least in the French market).

If so, what does this mean for the interpretation of the greater positive effect of biodynamic production in non-blind tastings as compare to blind tastings? Is this evidence of a simple category-reputation effect that does not depend on market signaling (the costs of membership being inverse to quality)? If organic and biodynamic viticulture are roughly equally productive (as we see in results from the static analysis of WS ratings), the initial differences in category reputations would tend to weaken over time. But our estimates of the dynamic specification tell that the gap judged from blind tastings is growing over time. Taking account of lagged ratings, biodynamic wines—but not organic wines—improve significantly in quality over vintages. This suggests that the strength of the market signal of biodynamic wines relative to organic ones is not fading, it is increasing. We view this pattern as one that suggests that market signaling at the category level has been at work.

One possible explanation for the negative effect for organic viticulture involves confidence beliefs. Agents typically make choices by focusing on the strength of the available evidence (Griffin and Tversky, 1992). Membership in the biodynamic category sends a strong signal, one consistent only with a hypothesis of high quality. The signal has high diagnosticity. Membership in the organic category as a signal lacks such strength because it is compatible with multiple hypotheses, including low quality. Pragmatically, critics aim to make judgments they will not regret. Then, the low diagnosticity of this category membership can generate under-confidence in the evaluation of offerings.

The surprising devaluation of organic wines by GM does not find a parallel in prices on the U.S. retail market. Consumers can, of course, learn which wines are organic and biodynamic (some list their category certifications on labels, others indicate their practices on their webpages, and the American wine press has extensive coverage of the move toward “natural” wines). And importers and distributors can take these views into account in setting retail prices. If organic wines have a poor reputation globally, then prices on the American market ought to reflect this. Given that they do not, we surmise that the initial poor reputation of organic wines was localized to the French (or perhaps European) market.

We want to stress an important caveat. Our research design capitalizes on the difference in method of evaluation of two sets of critics, one tasting blind and the other knowing the identity of the producer at the time of tasting. We attribute differences in patterns of association from the two critical sources as reflecting only the difference in method. In other words, we rely on the counterfactual that the two sets of critics would produce the same pattern of association if they both used blind tastings. Of course we cannot evaluate the plausibility of this counterfactual. Our study of the wine industry lead us to think that the two sets of critics would react similarly to what are generally regarded as defects in wine: off-aromas, excess acidity, lack of balance, and so forth. But this does not mean that they would react similarly to the wines that do not possess the obvious defects. Here differences in aesthetics might come into play, and the critics might diverge. As we noted above, only replications can tell whether the process we identify empirically is robust.

Processes involving concepts and categories have received much recent attention in several branches of sociology. In studies of markets, sociologists now conceptualize the dynamics of the interface of producers and audiences

in these terms (Zuckerman, 1999). Work on institutional fields, organizational forms, product classification systems, and social movements have been enriched by attention to categorical dynamics (for reviews, see DiMaggio (1997); Benford and Snow (2000); Hannan (2010); Negro, Koçak, and Hsu (2010)). This line of work shows that category boundaries are construed and controlled by the perceptions of audience members and that category-based processes have significant impact on market outcomes.

Our study on category signaling establishes three general connections to this literature. First, the signals conveyed by category membership help overcome information asymmetries that challenge the audience in screening producers of different quality. Second, membership in categories with sharper boundaries produces a more effective indicator of quality in the presence of multiple signals. That is, holding constant prior quality, a high-contrast category has a higher probability of emerging as a market signal. Apparently unproductive actions indicating category membership do not affect the quality of a producer's output. But, they can shape perceptions of the producers' identities that signal quality, according to our interpretation. Third-party certification agencies and critics, who often meet with producers one-on-one, can monitor active participation and valid membership in this distinctive category. Thus, the category membership itself can provide a monitoring mechanism for the quality signal. Third, the histories of category members link signals to quality when the audience observes actions not readily understood as requiring high capability.

Treatments of signaling generally stress intentionality: producers want to signal their quality and take actions accordingly. We do not make such strong reliance on intentions. What matters is that audience members come to associate quality with a practice that is hard to imitate for low-quality producers. So we do not focus on why some producers and not others chose to adopt biodynamic or organic viticulture, though that would be interesting as a separate line of inquiry. For us, the action is on the audience side.

The examination of multiple dimensions of producer identities, individual and collective, seems a fruitful avenue for future research. Another area to explore concerns the link between the structure of market categories and trust beliefs in the audience. Our findings suggest that category memberships can signal quality when other observables cannot. Categories with sharp boundaries perhaps play a role in judging trustworthiness, even when

the features that make a category distinctive are impractical and hard to decipher and when exchanges are not based on personal relationships between producers and audience members. We hope that our study provides ground for new work on these questions.

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